This machine is not adapted to the treatment of very coarse material, nor is it required for such, as the ordinary forms of "jigging" machines in common use are perfect enough for that. In reducing ore, however, to a size convenient for dressing, whether by stamping, crushing, or grinding, a varying proportion of rock and mineral is broken very fine, and, when carried off by water, is technically known as "slimes." Now, "slimes" are always more difficult to treat than the coarser particles, because much of the mineral is in so finely a divided state that it flows off readily in a stream of water and refuses to settle away from the accompanying fine rock. Many forms of washing-apparatus have been devised for the special treatment of slimes. Among the more successful may be mentioned plain and revolving buddles, inclined frames, shaking-tables of various descriptions, plain revolving-belts, blankets, and hide sluices.

In order to understand the conditions under which a machine must operate in order to extract the metalliferous constituents of a "slime" from the accompanying particles of rock or gangue, it will be worth while to examine the process of "vanning" on a shovel or pan, which is the most perfect method of separation we know of, because in it we employ the judgment—a thing which does not enter into the movements of machinery, except in adjusting the same. In vanning comparatively coarse particles of mixed rock and mineral a particular throw is communicated to the shovel or pan, which causes the contents to move forward by a succession of jumps, as it were; the metallic ores, being of a greater specific gravity than the sand, move ahead of it and form a distinct "head" of mineral easily distinguishable from the rock. With "slimes," however, the process of vanning is different: the muddy water is kept in gentle motion for some time by a circular motion of the shovel until the almost impalpable mineral slowly settles to the bottom; the motion is now interrupted for a short time to allow a further settling of the material, when a gentle wave of water is caused to flow repeatedly over it, washing the fine rock across the shovel ahead of the mineral, which withstands better the flow of water. In this second case the mineral cannot be thrown forward, as was first described; it has not weight or "body" enough for that, but is separated from the sand by taking advantage of the greater resistance it offers to a wash of water when once settled on the shovel. Here is a very important point, this clinging property of finely-divided mineral, which can be well illustrated by putting on to a common plate a small quantity of very finely-pulverised galena or other metallic ore. On wetting the ore and shaking it over the plate the clinging power of the fine mineral is shown when we try to wash the plate by a stream of water: as long as it is well covered with water the motion produces no effect to dislodge it. It is to this property of the slime-mineral that much of the great success of the Frue belt must be attributed: the shaking motion settles the mineral from the sand as it flows slowly down the belt, all the material being kept in gentle motion as in the preliminary settling on a shovel. When once the mineral has touched the surface of the belt it clings, and is carried up past the small streams of water at the head of the machine, and is dropped as the belt passes through the water-tank in a reversed position, even as it leaves the plate when reversed.

The shaking-motion communicated to the belt is of the utmost advantage in more ways than the settling of the mineral from the sand; for, by keeping all the material in motion, the belt can be set at a slighter angle, a smaller quantity of water used, and a much greater quantity of material operated on than if a simple belt without shaking-movement were employed. The sand does not "pack," causing the water to cut channels and run off in small streams, but is always uniformly distributed over the whole width of the belt. It is not necessary that the material on which the belt works should consist of the finest slimes; but, of course, as with all dressing machinery, the more uniform the size of the ore is, the better the results obtained.

As regards the ores on which the machine will work, the only point of importance is, that there be a fair difference between the specific gravity of the mineral to be saved and that of the waste matter with it. The following minerals have been worked upon with excellent results: Iron- and copper-pyrites, arsenical iron-pyrites, zinc-blende, galena, tin-stone, cinnabar, native silver, carbonates of lead and copper, and native copper; and, in the case of "tailings" from amalgamating-mills, "floured" quicksilver. "Slimes" flowing from settling-tanks have been experimented on, and made to yield the impalpable mineral which they contained.

The capacity of one machine is from 5 to 8 tons of rock per twenty-four hours. (They have been worked up to 12 tons.) The quantity of rock treated will depend on several circumstances. If the ore be of the very finest slimes, of course not so much of it can be treated as if some of the material be coarser. If a good separation is required the machine should not be crowded. Where the ore is stamped and screened through a screen of fifty holes to lineal inch, from 5 to 6 tons can be well separated; if the ore is a trifle coarser, 6 to 8 tons can be calculated on. For running a single machine, it is estimated that all the power required is only one-third of a horse-power; and one man attends to sixteen machines without difficulty, as the only work necessary is to oil them and keep them clean about the working-parts, regulate the water, and scrape out the concentrated mineral occasionally from the water-tank. As already stated, very little water is used—about half an inch, miners' measure, to each machine—less, probably for the quantity of rock treated than on any other form of washing-appliance. When six machines are used, the estimated cost of treating the sand when it is ready to flow on to the machine is less than 10d. per ton; but this, of course, is dependent upon the conditions under which they work. Of course, in these figures as to cost and ease with which the machines can be managed, it is taken for granted that the work is steady and the conditions are kept uniform, and under these circumstances what has been said in this connection is no mere matter of estimation, but is the result of actual working on a large scale for several years at a time. If the speed at which the machines are run is continually varying, or the quantity of ore delivered at the belt is not regular, it will take a man at each machine continually busy regulating the same to the constantly-changing conditions. This is a matter on which, however, it ought not to be necessary to insist, as any person of practical experience will appreciate at once the difference between fair and unfair conditions of working, and the difference between the cost of an experi-